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5.1 Energy and Conservation Issues

The Federal Government is the largest single user of energy in the United States and purchases $10–20 billion in energy-related products each year. With ownership of more than 500,000 buildings, including 422,000 housing structures, the Federal Government has a tremendous interest in energy efficiency in buildings. The Energy Policy Act of 1992 and Executive Order 13123 set goals for energy reduction and provide some guidelines for implementing conservation measures. Annual energy use in Federal buildings has dropped from 140,000 Btu/sq ft (1,600 MJ/m^2) in 1985 to 116,000 Btu/sq ft (1,300 MJ/m^2) in 1997. To meet the Executive Order 13123 requirement, annual energy use must drop to 90,800 Btu/sq ft (1,000 MJ/m^2) by 2010. FEMP provides information on technologies that have been proven in field testing or recommended by reliable sources, such as the DOE national laboratories.

Opportunities

The time for planning, evaluating, and implementing is now! Facility managers should first implement energy- and demand-reducing measures in their operations and then look for opportunities to cost-effectively replace conventional technologies with ones using renewable energy sources.

Facility managers should also set goals for their operations that follow Federal mandates. Executive Order 13123 requires an energy reduction in Federal buildings of 30% by 2005 and 35% by 2010, relative to 1985. Industrial and laboratory facilities are required to reduce energy consumption by 20% by 2005 and 25% by 2010, relative to 1990. Executive Order 13123 further states that agencies shall use life-cycle cost analysis in making decisions about their investments in products, services, construction, and other projects to lower the Federal government's costs and to reduce energy consumption. When energy-consuming equipment needs replacement, guidance for purchasing products that meet or exceed Executive Order 13123 procurement goals is available through FEMP's Product Energy Efficiency Recommendations series.

Technical Information

The *Energy Systems* section of this guide describes systems that provide key opportunities for energy savings. The following are some of these opportunities:

Integrated design is a process whereby the various disciplines involved in design—architect, mechanical engineer, electrical engineer, interior design professional, etc.—work together to come up with design solutions that maximize performance, energy conservation, and environmental benefits. Integrated design is an important aspect of energy conservation and equipment selection because decisions made in one area (lighting, for example) will affect others (such as chiller sizing). Refer back to *Section 4.1 – Integrated Building Design* for an overview.

HVAC system improvements offer tremendous potential for energy savings in most facilities. Opportunities include replacing older equipment with more efficient products, improving controls, upgrading maintenance programs, and retrofitting existing equipment to operate more efficiently. Central plants contain many interrelated components, and upgrading them takes careful planning, professional design assistance, and careful implementation. This guide covers chillers, boilers, air distribution systems, and other HVAC technologies.

Water heating is a major energy user in facilities with kitchens and laundries. Beyond reducing the use of hot water, various heat recovery and solar technologies can also help reduce operating costs.

Lighting. More than $250 million could be saved annually if all Federal facilities upgraded to energy-efficient lighting. Light energy savings of up to 40% can be achieved in interior applications by replacing lamps and ballasts. Savings of well over 50% are possible by designing and implementing an integrated approach to lighting that includes daylighting, task lighting, and sophisticated controls.

Office equipment is becoming an ever greater proportion of building loads. "Green" appliances that feature automatic power shutdown and more efficient electronics can help reduce energy consumption.

Energy Management and Control Systems (EMCSs) are critical in avoiding energy waste and monitoring energy consumption. Control technology should be applied intelligently for each situation, and an optimized mix of local and central control should be used.

Electric motor systems that operate around the clock (or nearly so) consume many times their purchase price in electricity each year. This makes inefficient, large-horsepower motors excellent targets for replacement. If the driven load operates at reduced speed a majority of the time, installing electronic motor controls could reduce both energy consumption and operating costs.

Electrical power systems can be made more efficient through (1) maintenance practices focused on identifying potential trouble areas, such as loose electrical connections; and (2) selection of efficient electrical equipment, such as transformers. There may also be opportunities to use renewable power-generation equipment.

Making It Happen

Carrying out energy efficiency improvements in Federal buildings is not simply about energy technologies and systems, it is also about financing and budgets. Here are a few financing strategies that can be applicable to Federal buildings. Also refer to *Section 2.4 – Alternative Financing*.

Energy Savings Performance Contracts provide Federal agencies with a means of increasing their investment in energy-saving technologies. Because appropriated funds are shrinking for many agencies, ESPCs enable them to secure financing from energy service contractors, or ESCOs, to identify and implement energy conservation measures. In effect, agencies can defer the initial costs of equipment and pay for the equipment through utility-bill savings. FEMP assists Federal agencies with ESPCs.

Super ESPCs are a facilitated form of ESPC. They are regional agreements in which delivery orders are placed against a contract with selected ESCOs. A Super ESPC allows individual facilities to negotiate contracts directly with certain competitively selected companies, greatly reducing the complexity of the ESPC process.

Basic Ordering Agreements (BOAs) are written understandings negotiated between GSA and a utility or other business that set contract guidelines for energy-consuming products and services. For example, the GSA Chet Holifield Federal Center in Laguna Niguel, California, contracted with its electric utility for thermal energy storage, energy-efficient chillers, variable-frequency drives, efficient motors, and lighting system retrofits. The contractor invested $3,800,000, and the government's share of the savings is $1,400,000 over 14 years. The GSA retains the equipment after the contract term. One prominent BOA specifying energy-efficient chillers for Federal procurement has been developed between GSA and five major chiller manufacturers in the United States. Other BOAs are being developed and will be available soon.

Source: Farallon National Wildlife Refuge

The U.S. Fish and Wildlife service needed a cleaner, quieter power source for the Farallon National Wildlife Refuge, 30 miles (48 km) west of San Francisco. Applied Power designed a 9.1-kW hybrid photovoltaic system to withstand the extremely corrosive island environment. Before this installation, the staff operated extremely loud, expensive diesel generators during daylight hours only.

References

Architect's and Engineer's Guide to Energy Conservation in Existing Buildings (DOE/RL/018-30P-H4), U.S. Department of Energy, Washington, DC, 1990.

Technology Atlas Series, E Source, Inc., Boulder, CO, 1996-97; (303) 440-8500; www.esource.com.

Contacts

To access FEMP's *Product Energy-Efficient Recommendations* series or obtain more information on financing alternatives, visit the FEMP Web site at www.eren.doe.gov/femp or call the FEMP Help Desk at (800) DOE-EREC (363-3732).